TABLE 1.

Some Properties of Soils from the Mulga Scrub and Degenerate Communities, and from the Mallee.

For further details see Appendix.

Community ..	MULGA SCRUB.																					MALLEE.	
Habitat	Rocky Ridges.								Stable Dunes.													Stable Dunes.	
Condition of community ..	Some mulga dead.				All mulga dead.			Bare soil.	Some mulga dead.			Most mulga dead.					All mulga dead.					Near-virgin.	
Erosion	Negligible.		Slight water.		Significant water.			Severe water.	Slight wind.			Severe wind.					Completely scalded.			Secondary dune.		None.	
Sample number ..	1	2	19	22	20	21	23	24	5	40	48	4	7	41	46	49	3	6	42	44	50	31	33
Pot culture experiments*:																							
Control	118	171	297	259	223	238	203	230	213	160	178	183	87	84	84	127	50	72	81	52	33	328	253
–Nitrate ..	128	186	301	271	209	274	285	199	244	167	245	141	130	135	138	116	45	83	81	52	30	377	256
–Phosphate ..	—	389	413	591	361	258	306	346	510	194	255	287	257	230	231	224	211	425	140	142	183	386	349
Full	480	512	579	563	542	297	369	358	—	434	313	350	—	316	357	353	291	—	387	342	316	373	397
Organic carbon, %	0·81	0·85	1·09	1·30	0·64	0·64	0·61	0·48	0·68	0·45	0·60	0·38	0·28	0·26	0·29	0·33	0·15	0·14	0·25	0·004	0·08	3·1	2·4
Total N, % ..	0·083	0·116	0·098	0·175	—	0·096	—	0·066	0·093	0·060	—	0·050	0·038	—	—	—	0·024	—	0·053	—	—	0·35	0·24
C/N ratio	9·6	7·6	11·1	8·6	—	6·7	—	7·3	7·3	7·5	—	7·6	7·4	—	—	—	6·3	—	4·8	—	—	8·9	10·3
NO_3–N, p.p.m. ..	11·0	14·3	16·9	16·7	—	8·7	9·5	10·9	9·6	4·5	—	9·6	5·3	—	—	—	6·1	5·8	2·1	—	—	29·4	19·4
NH_4–N, p.p.m. ..	2·3	5·5	4·2	7·1	—	4·1	5·1	5·1	—	—	—	3·3	2·7	—	—	—	2·8	2·7	1·9	—	—	5·6	2·6
Water-soluble salts, p.p.m.:																							
Ca	10	10	20	28	16	16	11	11	26	4	10	12	18	8	7	8	33	27	4	5	8	306	114
K	21	23	13	14	10	4	10	4	6	8	11	16	5	5	17	6	4	7	9	5	3	44	14
Na	34	68	45	35	24	28	20	45	10	13	32	24	28	19	23	19	23	27	34	14	13	83	46
Total P, p.p.m. ..	230	255	413	358	318	258	308	220	255	275	275	105	135	133	130	180	90	180	204	140	125	285	237
pH	6·9	7·3	6·2	6·0	7·6	6·9	7·2	7·3	7·3	6·0	6·5	6·3	8·1	5·9	6·0	6·0	7·0	7·6	5·4	6·9	6·3	7·1	7·4

* Dry weights of plants in mg.

C/N RATIO.

The C/N ratio is not a constant for the soils investigated. On the contrary, there is a gradual drop in the ratio which is correlated with the degree of erosion. The virgin or near-virgin communities give C/N values approximating the usual value of 10. Values well below 10 are found, however, in eroded soils, the greater the erosion, the lower the ratio. Even if we assume that the carbon figures are low on the grounds that the technique used does not recover 100% organic carbon, the trend in C/N ratio will still exist. We have no conclusive explanation for this drop, but tentatively advance the following: In a system from which the supply of organic matter from leaf fall is reduced or cut off, as on eroded soils (particularly on scalds, where the annual increment is close to zero), microbial activity commences when the soil becomes moist; CO_2 is lost during respiration and the resultant organic matter becomes richer in nitrogen, and in the extreme (the condition probably never exists) the whole of the carbon and nitrogen would be contained within the microbial cells with small quantities in the form of ammonium and nitrate. Though this explanation is purely theoretical, it is supported by the observation (above) that the surface of severely eroded soils is lower in organic carbon than are the deeper layers in the same profile. More detailed investigations of this phenomenon are being carried out.

SOIL PHOSPHORUS.

Total phosphorus (Table 1) varies considerably not only from community to community, but also from site to site within the same community. For non-eroded areas the highest values were recorded from the rocky ridges, the lowest from a mulga stand on the stable dunes. The lowest of the recorded figures indicate poor phosphate levels. The figures are similar to those quoted by Jessup (1951) for soils of arid South Australia. The highest cannot be regarded as high for semi-arid soils. For comparison the lowest figures quoted by Fuller and McGeorge (1951) for certain semi-arid soils of Arizona are of the same order as the highest figures obtained for soils from western New South Wales.

Available phosphate was determined in pot culture (Table 1); the figures indicate that phosphate is never a limiting factor, though in some soils the level is low in comparison with optimum requirement as indicated by the dry weights of the full culture treatment. There appears to be a good correlation between available phosphate determined by this technique and total phosphate determined chemically.

Phosphate levels need cause no concern from the economic point of view, since the phosphate content of the soil is not closely correlated with the organic carbon, and for this reason critical losses of phosphate cannot occur through wind erosion, as

TABLE 2.

Distribution of Organic Carbon and Phosphorus in the Profile of Soils of the Mulga Scrub.

Habitat ..	Rocky ridges.				Stable dunes.			
Condition of profile.	Possibly some sheet erosion.				No apparent erosion.		Drift-sand accumulation of 6″ over surface.	Wind eroded (scalded).
Herbaceous cover after rains.	Continuous.				Continuous.		Sparse.	None.
	O.C. %	P. p.p.m.	O.C. %	P. p.p.m.	O.C. %	P. p.p.m.	O.C. %	O.C. %
0– 1 inch ..	0·93	228	0·77	395	1·08±0·24	338	0·07	0–½ 0·21±0·13 ½–1 0·19±0·05
1– 3 inches ..	0·48	—	0·84	352	0·39±0	—	0·09	0·16±0·05
3– 6 ,, ..	0·45	210	0·23	285	0·33±0·14	205	0·12	0·18±0·05
6– 9 ,, ..	0·48	228	—	—	0·28±0·07	228	0·25	0·17
9–12 ,, ..	—	—	—	—	0·22±0·11	200	0·29	0·15
12–20 ,, ..	—	—	—	—	0·21	190	0·18	—

is the case with nitrogen. On the contrary, phosphate is associated with the mineral fractions of the soil and, although significant concentrations occur in the organic matter, it is still fairly evenly distributed down the profile (Table 2).

WATER-SOLUBLE SALTS.

Water-soluble salts (Table 1) are by far the highest in the mallee, where the soil solution is dominated by calcium ions. In all other communities sodium is the dominant ion. In all cases the supply of calcium and potassium would appear to be adequate for plant growth, and in all cases the concentration of the sodium ion is low, so that no inhibition either of the growth of green plants or of micro-organisms would be expected.

DISCUSSION.

The results which have been presented above enable us to draw a few simple conclusions; they also indicate how little is known about the fundamental processes concerned in the nitrogen economy of plant communities and the basic causes of degeneration and regeneration of plant communities. It is now clear that a simple solution to the mulga death problem and its many ramifications cannot be expected. Indeed a vast amount of research has still to be done in the fields of soil chemistry, microbiology, and plant physiology before the ecological aspects can be handled properly. In a short paper presented to the International Botanical Congress (Beadle and Tchan, 1954) a brief résumé of the overall problem has been given. With the additional data that have been presented above, some advances in the discussion can be made.

The figures for organic carbon and total nitrogen for soils affected variously by erosion leave no doubt that most of the organic matter and nitrogen are lost through erosion. Other sources of loss, however, cannot be overlooked. Loss of carbon must inevitably result from the respiration of micro-organisms (and possibly by chemical oxidation) in areas where additions of organic matter from plant debris are reduced to very low levels, as on badly eroded country. That this is occurring is suggested by the low levels of organic carbon in the surfaces of eroded areas, and by the fall in C/N ratio in such areas. Further investigations of these losses both under field and laboratory conditions are in progress.

The significance of such losses in communities where nitrogen is the limiting mineral nutrient cannot be over-emphasized. The significance of loss of nitrogen needs no further comment, but an additional remark on the organic matter is relevant. Since non-symbiotic organisms are entirely dependent on soil organic matter for their supply of energy, any loss in organic content must reduce the activity of non-symbiotic nitrogen-fixing organisms.

A further consequence of reduced levels of soil nitrogen is the possible change in floristic composition of the herbaceous sward. Formerly secondary successions were thought to be controlled either by micro-climatic conditions or by soil moisture. Now, however, we must consider an additional factor, soil nitrogen. It may well be that soil nitrogen is controlling both the rate of the succession and the species composition at the various stages in the succession, at least in some localities. If this be the case, then species of the successional stages would have low nitrogen requirements and low protein-content, which is of considerable significance to the pastoral industry.

A note on the possible sources of nitrogen to the communities may be inserted here. The known biological sources of nitrogen to a soil are those supplied either through the symbiotic *Rhizobia* associated with legumes or from non-symbiotic bacteria and photosynthetic organisms. A small contribution could also be expected from rainfall, and since rainfall is about equal for all communities, this addition should be the same for all communities. The figures for total nitrogen quoted in Table 1 show that the highest nitrogen figures occur in the mallee where legumes are extremely rare or lacking, and from this the tentative conclusion may be drawn that *Rhizobia* possibly play only a sub-dominant or even inconsequential role in the nitrogen economy of the legume-dominated communities. Apart from this observation, no conclusions as to the sources of nitrogen to the community can be made at this stage in the work. Many of the hypotheses and tentative conclusions outlined above are still under investigation by the writers. The second paper in this series will deal with the non-symbiotic nitrogen-fixing organisms.

Acknowledgements.

The writers are indebted to Professors R. L. Crocker and J. McLuckie, Department of Botany, to Dr. W. C. Ashby, Fulbright Scholar at the Department of Botany, and to Prof. J. M. Vincent, Faculty of Agriculture, for reading the manuscript and for helpful criticism; also to Misses Elaine Jackson and Maisie Thode, technical assistants, for help with chemical analyses.

Much of this work was done on the Department of Conservation's Rural Research Station at Fowler's Gap, and we wish to express our thanks to Messrs. C. K. Jacka and J. R. Butler, Chairman of the Conservation Authority and Under-Secretary of the Department of Conservation respectively, both for the use of the Station and for financial assistance to employ a technical assistant. One of us (N.C.W.B.) was financed, in part, by the Commonwealth Research Grants Fund of the University of Sydney, and this assistance is likewise gratefully acknowledged.

APPENDIX.

Techniques.

(*a*) *Field Sampling.*

About 1·5 kg. of the surface three inches of soil (excluding surface litter) from eight closely spaced areas were collected and mixed. In the case of profiles only a single pit was sampled, at depths indicated in the tables.

(*b*) *Pot Culture Experiment* (in glasshouse, Sydney).

Four plastic pots of soil (1 kg. in each pot) of each of the samples were treated as follows: (i) full culture solution added; (ii) full culture solution minus phosphate was added; (iii) full culture solution minus nitrate was added; (iv) distilled water only added. The full culture solution consisted of 10 c.c. $M.KNO_3$, 4 c.c. $M.KH_2PO_4$, 2 c.c. of $M.MgSO_4$ and $M.CaCl_2$ per pot. Oat grains were sown on the soil surface and covered with washed sand. When the oat seedlings had become established all but four were removed from each pot. The pots were watered when necessary. After a period of six weeks (mean temperature 30 ± 5° C.) the tops of the plants were harvested, dried at 100° C. and weighed. The mean weight of the plants in each pot was calculated. This mean weight is taken as a measure of the relative nutrient levels under the four treatments.

(*c*) *Organic Carbon.*

Organic carbon was measured by the Walkley-Black method, as outlined by Piper (1944). The results are given as carbon, and no correction has been made to account for incomplete recovery of the organic matter.

(*d*) *Total Nitrogen.*

Total nitrogen was estimated by the Kjeldahl technique. Ten to twenty gm. of soil were used, the estimates being made in duplicate. After reduction of nitrate with zinc powder (Jensen, 1940) the soil was digested. A drop of mercury was added in addition to $CuSO_4$ and K_2SO_4. After the dark colour had disappeared gentle heat was maintained for three hours. The mixture was cooled and the liquid made up to 500 c.c. Samples of 50 c.c. of this liquid were distilled with hyposulphite. The ammonia was titrated with N/56 H_2SO_4.

(*e*) *Ammonium.*

Ten gm. of soil were extracted with 60 c.c. N.NaCl, and 30 c.c. of the filtered extract were distilled with MgO. The ammonia was collected in water and measured quantitatively by the addition of Nessler's reagent. Measurements were done on a Unicam spectrophotometer at λ 4300Å.

(*f*) Nitrate.

Ten gm. of soil were extracted with 60 c.c. of water and the colloidal suspension was flocculated with a mixture of magnesium and calcium carbonates. Nitrate was estimated in the filtered solutions using the phenyl disulphonic acid technique of Lees and Quastel (1946). A Unicam spectrophotometer was used, measurements being made at λ 4250Å.

(*g*) *Total Phosphate.*

Five gm. of soil were boiled for four hours with 25 c.c. conc. HCl on a sandbath. The solution was filtered and made up to 250 c.c. Two c.c. of this solution were pipetted into a 50 c.c. volumetric flask and diluted with water. The solution was made slightly alkaline with N.NaOH, using p-dinitrophenol as indicator. The excess alkali was neutralized with N/10 H_2SO_4. Water was added to make about 45 c.c. One c.c. of 2·5% ammonium molybdate and 0·5 c.c. of freshly prepared $SnCl_2$ were added and the volume was made up to 50 c.c. with distilled water. The intensity of the blue coloration was measured at λ 6750Å on a Unicam spectrophotometer.

(*h*) *pH.*

pH was measured at the sticky points of the soils on a glass electrode potentiometer.

(*i*) *Water-soluble Salts.*

Twenty gm. of soil were extracted with 60% alcohol. The solution was filtered and Ca, K and Na were estimated after suitable dilutions on an Eel flame photometer. Blank estimations were done on the alcohol at the appropriate dilution.

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STUDIES OF BEAN ANTHRACNOSE IN AUSTRALIA.

By W. L. Waterhouse, The University of Sydney.

(Plate iii.)

[Read 27th April, 1955.]

Synopsis.

Two sets of studies of the host-parasite relationships shown between *Colletotrichum lindemuthianum* (Sacc. and Magn.) Briosi and Cav. and bean varieties were made. In the first, carried out between the years 1925 and 1928, 12 isolates of the fungus showed that 11 were similar to the U.S.A. beta race, and the remaining one has been designated Aust. *A*.

In the second set of studies, made between 1944 and 1952, 14 isolates studied on the same basis yielded seven races, all different from the two previously determined. Using a different selection of better known bean varieties, they have been sorted into eight races designated Aust. 1 to Aust. 8.

Making use of more than 130 bean varieties, the 14 isolates can be separated into 42 different groupings on the basis of the reactions shown to inoculation: the majority (98) of varieties were resistant to all the isolates.

From the varieties having both rust and anthracnose resistance, parents were chosen (Westralia receiving particular attention) for crossing with susceptible dwarf varieties, in order to incorporate in them the needed resistance. Serious incompatibility problems were encountered.

INTRODUCTION.

The disease known as anthracnose of beans, caused by the fungus *Colletotrichum lindemuthianum* (Sacc. & Magn.) Briosi & Cav., was first satisfactorily recorded overseas in 1843, and has been known in New South Wales since 1894 (Noble et al., 1934). In bean-growing countries it is an important disease causing serious crop losses under favourable weather conditions. An extensive bibliography is given by Harter and Zaumeyer (1944) as well as by others.

The studies here reported were commenced in 1925, but only in more recent years have they been intensively carried forward.

MATERIALS AND METHODS.

In 1921 a set of bean varieties then in use as differentials in sorting out physiologic races of the fungus was brought from Cornell University, U.S.A.; their reactions to the alpha, beta and gamma races were supplied by Dr. L. M. Massey. The original varietal names have been retained, and the beans have since been maintained as single plant—often single pod—selections, with the exception of three which were lost in adverse seasons. Recently many other varieties have been obtained from various sources, thanks to generous responses to requests for material; stocks of them have been maintained in the same way.

Seedlings have been used in plant house tests; in only a few cases has it been possible to check the results on mature plants. Seed treated with spergon was sown in four-inch pots of steamed soil which were kept on plant house benches. After emergence of the true foliage leaves the plants were atomized with a suspension of the inoculum under test, and the pots placed in an incubation chamber for a period of 36 to 48 hours, depending upon the prevailing weather conditions. Since there is the well-known inhibition of disease development at temperatures above the critical point, the work was done at the necessary lower temperature levels. The incubated plants were allowed to develop in the plant house, and when the lesions were clearly developed on the susceptible members in a series (usually after 7–10 days), notes were taken on the whole batch. In some instances where seed was in short supply, the resistant plants were pruned after note-taking, and if after the lapse of a proper period no lesions were showing on the new growth, they were used for the succeeding inoculation.

The inoculum came from various sources. The diseased material was plated in the usual way and pure cultures of the organism obtained; single spore cultures were used in several of the experiments, but this was not general. Individual cultures were maintained on potato-dextrose-agar. Inoculum for use in the plant house was obtained from the abundant fruiting growth made from transfers to sterile bean pods. It was agitated in tubes of sterile water for atomizing on to the plants. Particular series of pots under test were kept in isolated positions in the plant houses. There were cases where unexpected high temperatures made it necessary to repeat the experiment under favourable conditions. In all cases where any doubt existed the work was repeated.

Note-taking presented difficulty. In the case of fully susceptible varieties the seedlings were soon killed, whilst at the other end of the scale there was full immunity to attack. All kinds of intergrading reactions were found. It was finally decided to adopt a notation in which

0 = Immunity: hardly any visible reaction to inoculation.
1 = Resistance: small scattered lesions; plants recovered.
2 = Resistance: lesions obvious but no fructifications; plants recovered.
3 = Susceptible: numerous lesions and severe killing of tissues with abundant development of fructifications; plants died later.
4 = Susceptible: plants wilted and quickly died.

To denote variations in these behaviours, plus and minus signs were sometimes used. Because of the marked effects of changes in the environmental conditions, it is considered that the broad classification into resistant and susceptible classes is all that is desirable. With the variations that occurred in plant house conditions, reaction changes were found within both the resistant and the susceptible classes, but reasonable assurance was felt in regard to the determination that has been set down for one or other of the two classes.

EXPERIMENTAL RESULTS.

Studies of the Pathogen.

Isolates from different sources and at different times showed differences in their behaviour when grown on potato-dextrose-agar under the same conditions. The growth was usually dark and closely appressed to the surface, where the production of acervuli varied greatly. Others gave a somewhat effuse aerial development, with variations in its colour. Sectoring in some cultures was noted.

Clear differences of this sort led to attempts being made to produce the perfect stage of the fungus from combinations of isolates growing on differing substrates under varying conditions.

There were instances in which growth aggregations resembling perithecia developed, but in no case were asci found. This is in accord with other workers' results.

SPECIALIZATION.

The occurrence of variations in the susceptibility of beans to the disease was reported by Barrus in 1911, and since then many others have demonstrated the presence of physiologic races of the organism. The determinations have been based upon results obtained by using sets of bean varieties which have not always been uniform. Satisfactory comparisons of the results thus become difficult, if not impossible. It has been customary, however, to try to relate the results to those initially reported by Barrus (1918) and Burkholder (1923), who described three races, which they named the alpha, beta, and gamma races.

The work herein reported is conveniently considered as two sets of studies. The first, carried out between the years 1925 and 1928, involved the use of U.S.A. varieties which included differentials used by Barrus and Burkholder, with the addition of two common commercial varieties in use in New South Wales.

Then came a gap during which anthracnose work could not be carried out. The second set of studies covers the period 1944–1952, when work on a more extensive scale was done.

First Set of Studies.

At intervals during 1925 to 1928 diseased beans were obtained from various sources. In a number of cases they came from vegetable markets, and therefore their origin could not be determined. Pure cultures were made and used in the production of inoculum. In all, 12 distinct isolates were obtained.

In the tests it was found that 11 of them behaved similarly, but that the other one was differentiated clearly on one variety. The results are set out in Table 1, in which the reactions reported for the alpha, beta, and gamma races are included for purposes of comparison: cultures of them were not available for side-by-side tests.

TABLE 1.

Reactions Given by Isolates of C. lindemuthianum *on Bean Varieties Compared with those Recorded for U.S.A. Races.*

Accession Number.	Variety.	Reactions of Races.				
		Alpha.	Beta.	Gamma.	11 Isolates (Beta).	1 Isolate Aust. *A.*
B1	Red Cranberry (Low's Champion).	S	S	S	S	S
B2	Large White Marrow.	R	S	S	S	S
B3	Black Valentine.	S	S	S	S	S
B4	Tennessee Green Pod.	S	R	R	R	R
B5	Lazy Wife.	S	S	S	S	S
B6	Wardwell Kidney Wax.	S	S	S	S	S
B7	Red Kidney.	R	S	S	S	S
B8	Kentucky Wonder.	S	R	R	R	R
B9	Scotia.	S	R	R	R	R
B10	Well's Red Kidney.	R	R	S	R	R
B11	Eureka.	S	S	S	S	S
B12	Michigan Robust.	S	R	R	R	R
B13	White Imperial.	R	R	S	R	R
B14	Yellow Eye (Improved).	R	S	S	S	R
B15	Canadian Wonder.	S	S	S	S	S
B16	Epicure.	—	—	—	R	R

The original distinction between the alpha and beta races was made on the reactions shown by many varieties. Amongst them, B4 Tennessee Green Pod, B8 Kentucky Wonder, and B9 Scotia were susceptible to the alpha but resistant to the beta races, whilst B2 White Marrow, B7 Red Kidney, and B14 Yellow Eye were resistant to the alpha but susceptible to the beta races (Barrus, 1918). The gamma race differed from them in that B10 Well's Red Kidney and B13 White Imperial, which were resistant to the alpha and beta races, were found to be susceptible to the gamma race (Burkholder, 1923).

From Table 1 it is seen that the two groups of isolates differ in their behaviour on the variety B14 Yellow Eye (Improved), which also differentiates the alpha on the one hand from the beta and gamma races on the other. One of the two races (of which there were 11 isolates) agrees with the beta race. The other is different, and is here styled Aust. *A.* Both races show the same behaviour on the two N.S.W. varieties, B15 Canadian Wonder and B16 Epicure.

Second Set of Studies.

In this work the same U.S.A. varieties were used as differentials, but a different series of isolates was involved and, in addition, numerous other varieties were tested for their reactions.

The isolates were obtained from diseased material collected by the late Mr. R. D. Wilson, with the exception of No. 1034, which was submitted by Miss D. E. Shaw, and of No. 1026, by Mr. D. W. Reilly; to these thanks are tendered. A culture of the organism sent from New Zealand in 1944 was used in comparison with the others.

Details of the isolates are given in Table 2.

The varieties used included most of those already listed in the first set of studies, but many others also came up for test. The Principal of the Hawkesbury Agricultural College, Mr. E. A. Southee, Mr. Shirlow of the N.S.W. Department of Agriculture, and Mr. P. I. Pryke of the Victorian Department of Agriculture, were particularly helpful in supplying seed, and grateful thanks are tendered to them.

Serious problems connected with the purity of host material soon became apparent. Numerous cases were found in which there was clearly admixture of seed in a particular sample submitted; or seed carrying the same name but coming from two different sources was found to be quite different in colour and/or shape; or apparently similar seed carrying the same name was found to produce quite different types of plant; or seed of a particular variety was found to be heterozygous for its reactions to inoculation. Pedigree work thus became necessary. Even so, it is doubtful whether the results given by a variety bearing a particular name are always comparable with those reported for the "same" variety elsewhere. Strict standardization and retention of genetic purity are essential in work of this nature.

TABLE 2.

Details of the Isolates of C. lindemuthianum *Used in the Determinations.*

Accession Number.	Date of Receipt.	Source.
767	10 : 1944	Wamberal, N.S.W.
768	do.	do.
985	7 : 1949	Sandy Creek, Queensland.
986	do.	North Coast, N.S.W.
987	do.	Moruya, N.S.W.
988	do.	Sydney Markets.
989	do.	Bodalla, N.S.W.
990	do.	Lindfield, N.S.W.
1026	3 : 1950	Auburn, N.S.W.
1028	do.	Tenterfield, N.S.W.
1034	do.	Sydney Markets.
1035	7 : 1950	Gosford, N.S.W.
1036	do.	Tenterfield, N.S.W.
1038	10 : 1950	Gosford, N.S.W.
1043	do.	Gosford District, N.S.W.

In addition to the varieties listed and classified later, many others came up for tests in which limitations of time and of seed available made it impossible for all the tests to be completed; incomplete results of this sort have not been included.

Specialization.

Each of the isolates was used for race determination on the set of differentials listed on p. 73 under similar conditions to those used in the first set of studies.

The results are set out in Table 3, in which the determinations given on p. 73 are also included. Gaps occur where seed was not available for the tests.

From the isolates, neither the beta race nor the Aust. *A* race was obtained. The New Zealand culture corresponded with the gamma race. The 14 isolates examined were different from these all, and fall into races which are here designated Aust. *B* to Aust. *H*.

The isolates fall into the following categories:

Race Aust. *B* = Isolate 768
Aust. *C* = 767, 1038
Aust. *D* = 985
Aust. *E* = 986, 988
Aust. *F* = 987, 1028, 1036
Aust. *G* = 989, 990, 1026, 1034, 1043
Aust. *H* = 1035